

Solving Exponential Equations with Logarithms

Date _____ Period _____

Solve each equation. Round your answers to the nearest ten-thousandth.

#1-20 leave ans EXACT
21-24 round 4 dec pl.

1) $3^b = 17$

$$\log_3 3^b = \log_3 17$$

$$b = \log_3 17$$

2) $12^r = 13$

$$\log_{12} 12^r = \log_{12} 13$$

$$r = \log_{12} 13$$

3) $9^n = 49$

$$\log_9 9^n = \log_9 49$$

$$n = \log_9 49$$

4) $16^v = 67$

$$v = \log_{16} 67$$

5) $3^a = 69$

$$a = \log_3 69$$

6) $6^r = 51$

$$r = \log_6 51$$

7) $6^n = 99$

$$n = \log_6 99$$

8) $20^r = 56$

$$r = \log_{20} 56$$

9) $5 \cdot 18^{6x} = 26$

$$18^{6x} = \frac{26}{5}$$

$$\log_{18} 18^{6x} = \log_{18} \left(\frac{26}{5} \right) \quad 6x = \log_{18} \left(\frac{26}{5} \right)$$

10) $e^{x-1} - 5 = 5$

$$e^{x-1} = 10$$

$$\ln e^{x-1} = \ln 10$$

$$x-1 = \ln 10$$

$$x = \ln(10) + 1$$

11) $9^{n+10} + 3 = 81$

$$9^{n+10} = 78$$

$$\log_9 9^{n+10} = \log_9 78$$

$$n+10 = \log_9 78$$

$$n = \log_9 (78) - 10$$

12) $11^{n-8} - 5 = 54$

$$11^{n-8} = 59$$

$$\log_{11} 11^{n-8} = \log_{11} 59$$

$$n-8 = \log_{11} 59$$

$$n = \log_{11} (59) + 8$$

$$13) 16^{n-7} + 5 = 24$$

$$16^{n-7} = 19$$

$$\log_{16} 16^{n-7} = \log_{16} 19$$

$$n-7 = \log_{16} 19$$

$$n = \log_{16} 19 + 7$$

$$14) 20^{-6n} + 6 = 55$$

$$20^{-6n} = 49$$

$$\log_{20} 20^{-6n} = \log_{20} 49$$

$$-6n = \log_{20} 49$$

$$n = -\frac{1}{6} \log_{20} 49$$

$$n = \log_{20} (49)^{-\frac{1}{6}}$$

$$15) 5 \cdot 6^{3m} = 20$$

$$6^{3m} = 4$$

$$\log_6 6^{3m} = \log_6 4$$

$$3m = \log_6 4$$

$$m = \frac{1}{3} \log_6 4$$

$$m = \log_6 (4)^{\frac{1}{3}}$$

$$16) 8^{-5a} - 5 = 53$$

$$8^{-5a} = 58$$

$$\log_8 8^{-5a} = \log_8 58$$

$$-5a = \log_8 58$$

$$a = -\frac{1}{5} \log_8 58$$

$$a = \log_8 (58)^{-\frac{1}{5}}$$

$$17) -2 \cdot e^{-3n-8} - 3 = -45$$

$$-2e^{-3n-8} = -42$$

$$e^{-3n-8} = 21$$

$$-3n-8 = \ln 21$$

$$-3n = \ln(21) + 8$$

$$n = -\frac{1}{3} \ln(21) - \frac{8}{3}$$

$$n = \ln(21)^{-\frac{1}{3}} - \frac{8}{3}$$

$$18) 10 \cdot e^{2n-10} - 5 = 73$$

$$10e^{2n-10} = 78$$

$$e^{2n-10} = \frac{39}{5}$$

$$\ln e^{2n-10} = \ln \left(\frac{39}{5} \right)$$

$$2n-10 = \ln \left(\frac{39}{5} \right)$$

$$2n = \ln \left(\frac{39}{5} \right) + 10$$

$$n = \ln \left(\frac{39}{5} \right)^{\frac{1}{2}} + 5$$

$$19) 10 \cdot e^{10-3m} - 8 = 23$$

$$10e^{10-3m} = 31$$

$$e^{10-3m} = \frac{31}{10}$$

$$10-3m = \ln \left(\frac{31}{10} \right)$$

$$-3m = \ln \left(\frac{31}{10} \right) - 10$$

$$m = -\frac{1}{3} \ln \left(\frac{31}{10} \right) + \frac{10}{3}$$

$$m = \ln \left(\frac{31}{10} \right)^{-\frac{1}{3}} + \frac{10}{3}$$

$$20) -8 \cdot e^{5-6x} + 10 = -16$$

$$-8e^{5-6x} = -26$$

$$e^{5-6x} = \frac{13}{4}$$

$$5-6x = \ln \left(\frac{13}{4} \right)$$

$$-6x = \ln \left(\frac{13}{4} \right) - 5$$

$$x = -\frac{1}{6} \ln \left(\frac{13}{4} \right) + \frac{5}{6}$$

$$x = \ln \left(\frac{13}{4} \right)^{-\frac{1}{6}} + \frac{5}{6}$$

Do on
calc
1+21-24

$$21) -5.1 \cdot e^{10n+2} + 7.9 = 2$$

$$n = -0.1854$$

$$22) 5.1 \cdot e^{10b+8} - 7 = 76.4$$

$$b = -0.5206$$

$$23) 3 \cdot e^{4-3x} + 1.6 = 45.6$$

$$x = 0.4381$$

$$24) -2 \cdot e^{9.4x-5} + 6 = -68.9$$

$$x = 0.9173$$